

TABLE OF CONTENTS

LIST OF TABLES	v
LIST OF FIGURES	v
LIST OF APPENDICES	v
CLOSED MISTER M LANDFILL, LICENSE #302	
LEWISTOWN, FERGUS COUNTY, MONTANA	
GROUNDWATER AND METHANE MONITORING	
SAMPLING AND ANALYSIS PLAN	
1.0 INTRODUCTION	1
2.0 SITE DESCRIPTION	1
2.1 LOCATION	1
2.2 SITE HISTORY	1
2.3 SITE HYDROGEOLOGY	2
2.4 SITE ACCESS	3
3.0 GROUNDWATER MONITORING PLAN	4
3.1 OBJECTIVES	4
3.2 SCHEDULE	4
3.3 INFORMATION	4
3.4 FIELD PROCEDURES	4
3.4.1 Standards	5
3.4.2 Monitoring Points	5
3.4.3 Water Level Measurements	5
3.4.4 Monitoring Well Paving	6
3.4.5 Sample Collection	7
3.4.6 Shipping and Handling	8
3.5 DATA HANDLING AND ANALYSIS	8
3.5.1 Statistical Analysis	8
3.5.2 Reporting	9
4.0 METHANE MONITORING PLAN	10
4.1 OBJECTIVES	10

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TABLE OF CONTENTS

LIST OF TABLES	v
LIST OF FIGURES	v
LIST OF APPENDICES	v
1.0 INTRODUCTION	1
2.0 SITE DESCRIPTION	1
2.1 LOCATION	1
2.2 SITE HISTORY	1
2.3 SITE HYDROGEOLOGY	2
2.4 SITE ACCESS	3
3.0 GROUNDWATER MONITORING PLAN	4
3.1 OBJECTIVES	4
3.2 SCHEDULE	4
3.3 NOTIFICATION	4
3.4 FIELD PROCEDURES	4
3.4.1 Monitoring Wells	5
3.4.2 Monitoring Parameters	5
3.4.3 Water Level Measurements	5
3.4.4 Monitoring Well Purging	6
3.4.5 Sample Collection	7
3.4.6 Shipping and Handling	8
3.5 DATA HANDLING AND ANALYSIS	8
3.5.1 Statistical Analyses	8
3.5.2 Reporting	9
4.0 METHANE MONITORING PLAN	10
4.1 OBJECTIVES	10

4.2	SCHEDULE	10
4.3	MONITORING LOCATIONS AND PARAMETERS	10
4.4	MEASUREMENT PROCEDURE	10
4.5	REPORTING	11
5.0	QA/QC PLAN	12
5.1	FIELD QA/QC PROCEDURES	12
5.1.1	Instrument Calibration	12
5.1.2	Equipment Decontamination Procedures	12
5.1.3	Field Documentation	13
5.1.4	Field QA/QC Samples	14
5.1.5	Chain-of-Custody Requirements	15
5.2	ANALYTICAL LABORATORY QA/QC PROCEDURES	15
5.2.1	Sample Receipt Procedures	15
5.2.2	Sample Holding Time Requirements	16
5.2.3	Data Reporting Requirements	16
5.2.4	Laboratory Internal QA/QC Plan	16
5.3	DATA VALIDATION	16
6.0	HEALTH AND SAFETY PLAN	18
6.1	SITE HAZARDS	18
6.1.1	General Hazards	18
6.1.2	Groundwater Monitoring Hazards	18
6.1.3	Methane Monitoring Hazards	18
6.2	LEVEL OF PROTECTION	19
6.3	PERSONNEL DECONTAMINATION PROCEDURES	19
6.4	DISPOSAL OF PURGE WATER	19
6.5	EMERGENCY INFORMATION	20
7.0	REFERENCES	21

LIST OF TABLES

TABLE 1: ANALYTICAL PARAMETERS FROM ARM 17.50.708 TABLE 1

TABLE 2: PURGING STABILIZATION CRITERIA

TABLE 3: SAMPLE BOTTLES AND PRESERVATIVES

TABLE 4: HOLDING TIMES FOR TABLE 1 PARAMETERS

LIST OF FIGURES

FIGURE 1: LOCATION MAP

FIGURE 2: FACILITY MAP

FIGURE 3: LOCATIONS OF GROUNDWATER MONITORING WELLS

FIGURE 4: LOCATIONS FOR METHANE MONITORING

FIGURE 5: LOCATION OF THE CENTRAL MONTANA MEDICAL CENTER

LIST OF APPENDICES

APPENDIX A: FIELD FORMS

1.0	INTRODUCTION	1
1.1	Background	1
1.2	Objectives	1
1.3	Scope	1
1.4	References	1
2.0	QUALITY ASSURANCE	2
2.1	Quality Assurance Plan	2
2.2	Quality Assurance Procedures	2
2.3	Quality Assurance Personnel	2
2.4	Quality Assurance Equipment	2
2.5	Quality Assurance Materials	2
2.6	Quality Assurance Methods	2
2.7	Quality Assurance Records	2
2.8	Quality Assurance Reporting	2
2.9	Quality Assurance Review	2
3.0	ANALYSIS	3
3.1	Sample Collection Procedures	3
3.2	Sample Holding Time Requirements	3
3.3	Data Reporting Requirements	3
3.4	Laboratory Index (QA/QC Plan)	3
4.0	DATA VALIDATION	4
5.0	HEALTH AND SAFETY PLAN	5
5.1	Site Hazards	5
5.2	Control Hazards	5
5.3	Emergency Response Procedures	5
5.4	Personal Protective Equipment	5
5.5	Emergency Information	5
6.0	REFERENCES	6

1.0 INTRODUCTION

This document is the Sampling and Analysis Plan for Groundwater and Methane Monitoring at the closed Mister M Landfill, License #302, in Lewistown, Fergus County, Montana. As required by the Administrative Rules of Montana (ARM) 17.50.531(1)(a) groundwater and methane monitoring must be conducted throughout the post closure care period of all Class II landfills. The Groundwater Monitoring Sampling and Analysis Plan must be prepared to meet the requirements of ARM 17.50.708(1) and must be updated at least every ten years for closed facilities as required by ARM 17.50.709(b)(iii). A Methane Monitoring Plan is required by ARM 17.50.509(2)(j) and must meet the requirements of ARM 17.50.511(1)(g). These plans must be approved by the Montana Department of Environmental Quality (MDEQ), Solid Waste Section and placed in the operating records of the facility.

2.0 SITE DESCRIPTION

2.1 SITE LOCATION

Mister M Landfill is in Fergus County approximately four miles east of Lewistown on US Highway 87, as shown in Figure 1. The facility is located in Township 15 North, Range 19 East, Section 8, at 7 Boyd Creek Road on a 48.974 acre parcel, and is owned by Marvin and Sandra Mintyala. As shown in Figure 2, the landfill lies in a small south facing coulee which drains to Boyd Creek. The landfill operations were conducted primarily on the 30 acres of the parcel that lie to the north of the old railroad grade.

2.2 SITE HISTORY

Waste disposal at the site began in 1956 and the property was purchased by the current owners in 1974. The State of Montana first issued the facility a solid waste disposal license in 1979. From 1990 to 1997 the facility actively operated under Class II landfill license #302. The waste stream was typical municipal solid waste; including paper, plastics, some household metals, and seasonally some woody debris and brush. White goods and ferrous and non-ferrous metals were accepted and stockpiled at the site for transfer to scrap dealers. The facility stopped receiving

wastes by September 15, 1998, and was granted interim closure status on December 5, 2000. Final closure of the site has not been granted due to outstanding obligations of the owners.

2.3 SITE HYDROGEOLOGY

According to the Geohydrologic Characterization (Gillespie, 1993 revised; and Gillespie, 1994) the landfill is underlain by the Kootenai Formation, which consists of predominately shale with some silty sandstone. A basal unit of sandstone in the Kootenai formation is the uppermost aquifer in the area. Minor amounts of water have been encountered in the upper portions of the Kootenai Formation but the monitoring wells completed at the site have generally been dry since their installation, or contained minimal volumes of water. Due to the transient nature of water in these wells, the groundwater flow direction in the upper portion of the Kootenai is undetermined but likely is similar to that in the basal sandstone aquifer. The office well, house well, and other residential wells in the area are completed in the basal sandstone unit of the Kootenai Formation and indicate a general direction of groundwater flow in this unit to the southwest. The lack of monitoring wells or piezometers in the uppermost aquifer prevent a thorough evaluation of groundwater flow at the site.

Previous groundwater sampling at the facility was conducted by the owners or their consultants from 1993 to 1999 (Gillespie, 1995 and 1996; Energy Laboratories, 1997, 1998 (1), and 1998 (2); and Portage Environmental, 1999 and 2000). From 2003 to 2007 Tetra Tech, Inc was authorized by the MDEQ to conduct groundwater monitoring in the absence of action by the owners (Energy Laboratories, 2003, 2004, 2005, 2006, and 2007; Maxim, 2005; Tetra Tech, 2006 and 2008). The quality of the groundwater data from 1993 to 1999 is questionable due to inconsistent and non-standard sampling practices. The monitoring wells are frequently dry and have a limited volume of water when present, and the deeper wells that are completed in the uppermost aquifer are water supply wells not monitoring wells. These factors impart variability to the analytical data which must be considered when analyzing groundwater quality at the facility.

Groundwater at the facility typically exhibits a neutral to slightly alkaline pH between 7 and 8 and specific conductance (SC) between 600 and 700 $\mu\text{mhos/cm}$. Nitrate + nitrite is generally

present in the shallower monitoring wells at concentrations of 1 to 3 mg/l, but not detected in the deeper wells. The concentrations of chloride, sulfate, and chemical oxygen demand (COD) are highly variable. The metals that are commonly detected at the facility are barium and zinc in all wells, iron in the deeper wells, and selenium in the shallower wells. Several volatile organic compounds (VOCs) have been detected in the facility wells, but are generally at or near the reporting limit with the exception of cis-1,2-dichloroethene and vinyl chloride in the Office Well and MW-10.

2.4 SITE ACCESS

On December 2, 2002 the MDEQ received permission from the owners' representative, Mr. Timothy O'Hare, to access the site to conduct post closure care activities in the absence of the owners. Access to the site is controlled by a locked gate at the entrance. Access to the monitoring wells is controlled by locked caps. The keys to the locks can be obtained from the MDEQ, Solid Waste Section.

3.0 GROUNDWATER MONITORING PLAN

3.1 OBJECTIVES

The objective of this Groundwater Monitoring Plan is to describe the groundwater monitoring program for the Mr. M facility as required in ARM 17.50.708(1). This includes describing the schedule of monitoring, the locations and parameters that will be monitored, the field procedures that will be followed during sampling, and how the resulting data will be analyzed and reported. The facility is currently in detection level monitoring, the goal of which is to detect statistically significant changes in water quality parameters that may indicate a release of contamination from the landfill to groundwater.

3.2 SCHEDULE

As required ARM 17.50.708(4)(a) groundwater monitoring at the facility will be conducted on an semi-annual basis. Samples will be collected each year in May or June, when groundwater levels should be higher due to the spring snowmelt. This will provide the greatest opportunity to collect samples from the shallower monitoring wells at the facility which are frequently dry.

3.3 NOTIFICATION

ARM 17.50.708(1)(a)(iv)(G) requires that the MDEQ, Solid Waste Section be notified prior to each sampling event. This notification provides the opportunity for the MDEQ, Solid Waste Section to observe the sampling methods and/or to collect split samples. Written notification will be provided to the MDEQ, Solid Waste Section at least fourteen days prior to sampling in the form of a letter, e-mail, or fax.

3.4 FIELD PROCEDURES

The following field procedures will be used during each sampling event. Consistent and proper groundwater sampling methods and sample handling techniques are necessary to ensure that the analytical results are valid and legally defensible.

3.4.1 Monitoring Wells

There have been several monitoring wells installed at the facility, however, due to poor record keeping and well maintenance, location and identification of the monitoring wells is problematic. The monitoring wells that have been located and their tentative identifications are shown in Figure 3. MW-5 is up-gradient of the landfill and MW-6 is cross-gradient. All other wells are down-gradient of the landfill area. The point of compliance wells are MW-10, MW- 1, MW-9, and the Office Well. During each sampling event all of the monitoring wells will be inspected as required in ARM 17.50.724(2) and any damage will be reported in writing to the MDEQ within ten days. The monitoring wells will be sampled in the following order, if water is present: MW-5, MW-9, MW-1, MW-10, Office Well, and House Well. Groundwater levels will also be measured in MW-2, MW-4, MW-6 and MW-7. QA/QC samples including an equipment blank and field duplicate will be collected during each sampling event as described in Section 5.1.4.

3.4.2 Monitoring Parameters

In accordance with the requirements for a detection monitoring program, the monitoring wells at the Mr. M facility will be sampled for all of the parameters listed in ARM 17.50.708 Table 1, which is reproduced in this document in Table 1. The VOCs samples will be collected first, followed by cyanide second; dissolved metals third; nitrate + nitrite and COD fourth; and finally chloride, sulfate, pH, and SC. In addition, pH, SC, and temperature will be measured in the field following well purging as required by ARM 17.50.708(7).

3.4.3 Water Level Measurements

The static water levels in wells MW-1, MW-2, MW-4, MW-5, MW-6, MW-7, MW-9, MW-10, and the Office Well will be measured prior to each sampling event. The static water level in the House Well will not be measured due to the well's construction. Static water levels will be measured to the nearest 0.05 feet as required in ARM 17.50.708(5) using a decontaminated electric water level probe. The water level probe will be tested and then lowered into the well until the probe indicates that water has been encountered. The water level probe will then be raised out of the water and lowered back to the air-water interface very slowly for a precise measurement of the water level. This depth will be double-checked to ensure accuracy. The

reference point for the water level measurements will be the north side of the inner well casing unless otherwise marked. All water level measurements will be recorded on the Water Level Measurement Form included in Appendix A.

3.4.4 Monitoring Well Purging

Each monitoring well will be purged prior to sampling to ensure that the samples collected are representative of groundwater and not stagnant water in the well bore. The well purging procedures for this facility vary due to the well construction details and the volume of water present in the wells. The wells will be purged with a non-dedicated decontaminated submersible pump if possible; otherwise a new disposable polyethylene bailer with double check valves will be used. The Monitoring Well Purging and Sampling Form included in Appendix A will be completed for each well that is sampled.

Prior to purging, the static water level and total depth of the well will be measured. Static water level will be measured at all wells except the House Well as described in Section 3.4.3 and recorded. The total depth of the well will be measured at MW-1, MW-5, MW-9, and MW-10 by sounding the well with the water level probe. To sound the well, the water level probe will be turned off and lowered into the well until the reduction of tension on the tape indicates that the probe is at the bottom of the well. This depth will then be recorded and corrected for the distance between the probe electrode and the bottom of the probe. The volume of water in the well will then be calculated using the following formula:

$$\text{Well Volume (gal)} = [\text{Total Depth (ft)} - \text{Static Water Level in (ft)}] * C$$

where C = 0.163 for a 2 inch well and 0.653 for a 4 inch well. The result will be recorded and multiplied by three to determine the volume necessary for purging as described below.

When using a submersible pump, the pump will be fitted with new disposable tubing and lowered into the well slowly until the desired depth is reached. The pump will be secured at this depth and the well will be purged at a rate not exceeding one gallon per minute. When a bailer is used, it will be lowered into the well and removed slowly so as to minimize the agitation of the water in the well. The bailer will not be allowed to touch the ground or any other object and will only be handled with clean gloves when emptying. The volume of water purged will be

measured by discharging the purge water into a vessel of known volume, such as a five gallon bucket. The field parameters of the purge water including pH, SC, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity will be measured at least once per well volume, and no more frequently than once per half well volume. For monitoring wells MW-1, MW-5, MW-9, and MW-10 purging will continue until three well volumes have been removed and the field parameter readings have stabilized according to the criteria in Table 2. If a well is purged dry, it will be allowed to recover to 90% of the initial static water level or for a maximum of two hours and then sampled. If insufficient water is available to collect all the samples they will be collected with the following priority: VOCs; nitrate + nitrite and COD; chloride, sulfate, pH, and SC; dissolved metals; and cyanide. Because the Office Well and House Well were constructed as water supply wells and not monitoring wells these wells will be purged until the stabilization criteria in Table 2 are met for three consecutive readings at least five minutes or five gallons apart, whichever is greater.

3.4.5 Sample Collection

After purging is complete the samples will be collected in the order listed in Section 3.4.2 and Table 3 using pre-cleaned bottles supplied by the laboratory. Each sample bottle will be labeled in the format: MrM-XXXX, where XXXX is the sample location identification. The Office Well and House Well will be abbreviated as OW and HW respectively. The labels for each sample bottle will also contain the date and time of collection, analyses requested, any preservation agents used, and the initials of the sampler. Table 3 shows the type and size of bottles, and the preservative that will typically be used for the samples. The bottle type and size may vary depending on what is supplied by the laboratory.

If the samples are collected using a submersible pump, they will be collected directly from the discharge tubing at a pumping rate of one quarter gallon per minute or less. If a water quality meter with a flow-through cell is used it will be disconnected prior to sampling. If the samples are collected using a bailer, they will be collected from the bottom of the bailer using a bailer draining device, not by pouring water out of the top of the bailer. All sample bottles will be filled slowly, so that the water entering the bottle does not produce turbulence or aeration. The preservative will be added to the VOCs vials before they are filled, and they will not be allowed

to overflow. A small amount of water placed in the vial cap will be used to complete the filling of the VOCs vials, producing a meniscus over the mouth of the vial. The cap will then be carefully fitted and the vial checked for air bubbles by inverting it and tapping the side. If air bubbles are present in the vial it will be opened, emptied, re-preserved, and a new sample will be collected as described above. All other samples will be collected by filling the bottles to a level slightly below the top, then adding the preservative as necessary. The dissolved metals samples will be field filtered using a disposable 0.45 micron filter attached directly to the discharge tubing or the outlet port of the bailer draining device.

3.4.6 Shipping and Handling

All samples will be placed on ice in coolers immediately after collection, and will remain on ice or in a refrigerator at a temperature of $4\pm 2^{\circ}\text{C}$ until delivered to the analytical laboratory. The samples will be delivered to the laboratory by hand or via a shipping service either the same day or next business day after the completion of sampling. Chain-of-custody procedures will be followed as described in Section 5.1.5.

3.5 DATA HANDLING AND ANALYSIS

When the analytical data is received from the laboratory it will be checked for completeness and then validated as described in Section 5.3. The laboratory will be contacted if there is any missing data or to resolve any validation issues. After the data is validated, it will be entered into a database containing all groundwater data for the Mr. M facility in the format required for the statistical analysis.

3.5.1 Statistical Analysis

The purpose of statistical analysis for a facility in detection level monitoring is to identify any statistically significant increases over background levels that may indicate a release of contamination from the landfill. According to ARM 17.50.708(14)(a) the owner or operator must determine if a statistically significant increase over background values has occurred by comparing the groundwater quality of each parameter to its background value at each point of compliance well.

For the shallow compliance wells (MW-1, MW-9, and MW-10), MW-5 is located up-gradient of the landfill and will be used to determine background levels. For the Office Well the House Well will be used as a substitute for a background well. Although the House Well is cross-gradient to the Office Well, and down-gradient or cross-gradient to the landfill, previous analyses from the House Well appear to represent natural groundwater conditions. Following each sampling event, the data from the House Well will be evaluated using an intra-well analysis to determine if any significant changes in the water quality at this well have occurred. Any outliers identified by this analysis will be excluded when using the data from the House Well as the background data for the Office Well.

The distribution of the datasets from the two background wells (MW-5 and the House Well) will be determined for each parameter prior to performing the statistical analyses. If the data is determined to have a normal distribution, a parametric test will be performed on the data. If the data is determined to have a log-normal distribution, a parametric test will be performed using the transformed data. If the data is determined to have a non-normal distribution, a non-parametric test will be performed. For all parameters that are detected in the compliance wells, the data from the compliance wells will be compared to the appropriate background dataset using a tolerance interval analysis. If a parameter is detected at a statistically significant level above background, a non-parametric test for trend will be performed to assist in the determination if the exceedance represents a statistical outlier or a significant increasing trend. In addition, a historical concentration plot will be prepared for all parameters detected in compliance wells to help analyze temporal trends.

3.5.2 Reporting

Pursuant to ARM 17.50.708(15) the sampling results, groundwater elevation data, and any deviations from this Sampling and Analysis Plan will be reported to the MDEQ, Solid Waste Section within 90 days of sampling. This report will include copies of the field data sheets, chain-of-custody documents, laboratory analytical report, and laboratory QA/QC report. This report will also include a determination of groundwater flow direction and seepage velocity, and the results of the statistical analysis.

4.0 METHANE MONITORING PLAN

4.1 OBJECTIVES

The objective of this Methane Monitoring Plan is to describe the methane monitoring program for this facility as required in ARM 17.50.511(1)(g). The objective of the methane monitoring program is to ensure that the concentration of methane gas does not exceed 25% of the lower explosive limit (LEL) in facility structures and does not exceed the LEL at the facility property boundary as required by ARM 17.50.511(1)(f). The LEL for methane is a concentration of 5%, thus 25% of the LEL is a concentration of 1.25%.

4.2 SCHEDULE

As required in ARM 17.50.511(g)(ii) the methane levels at the facility will be monitored quarterly. Methane monitoring will typically be conducted in March, June, October, and December, and will be combined with groundwater monitoring events when possible.

4.3 MONITORING LOCATIONS AND PARAMETERS

Methane monitoring will be conducted at four monitoring wells surrounding the facility; MW-5M, MW-6M, MW-8, and MW-11M. In addition methane levels will be measured in all facility structures. The locations for methane monitoring are shown in Figure 4. The concentrations of methane and oxygen will be measured at all of the monitoring locations.

4.4 MEASUREMENT PROCEDURES

A handheld gas meter will be used to measure the concentrations of methane and oxygen at each monitoring point. At the monitoring wells, the gas concentrations will be measured in the sealed well casing. In the facility structures, the gas concentrations will be measured in a poorly ventilated area on the lowest level of the structure. All gas measurements will be double-checked for accuracy. The measured methane and oxygen concentrations for each location will be recorded on the Methane Monitoring Form included in Appendix A.

4.5 REPORTING

The results of the methane monitoring will be reported to the MDEQ, Solid Waste Section. This report will contain copies of the field sheets and any observations made during monitoring. If the methane gas levels exceed the limits set in ARM 17.50.511(1)(f), the MDEQ Solid Waste Section will be notified as soon as possible. Notification in writing of the levels of the methane gas exceedance and a description of the measures taken to protect human health must be submitted to the MDEQ, Solid Waste Section within 7 days of detection, and an MDEQ approved methane gas remediation plan will be implemented within 60 days of detection.

5.0 QA/QC PLAN

5.1 FIELD PROCEDURES

This section describes the field QA/QC procedures that will be implemented during groundwater and methane monitoring to ensure that the data produced is valid and legally defensible.

5.1.1 Instrument Calibration

All field instruments used during groundwater and methane monitoring will be calibrated according to manufacturer specifications at the beginning of each day of work. Additionally, instrument readings will be compared to previous measurements at the same location to check for consistency. If at any time an instrument reading is considered suspect, the instrument will be recalibrated. The water quality meters will be calibrated to appropriate reference solutions for the parameters being measured, and the calibration will be documented on the Water Quality Meter Calibration Form included in Appendix A. The landfill gas meter will be calibrated to a methane reference standard, and the calibration will be documented on the Methane Monitoring Form included in Appendix A.

5.1.2 Equipment Decontamination Procedures

All non-disposable equipment that comes into contact with groundwater will be decontaminated between monitoring wells. The water level probe and water quality meter reservoir (container or flow-through cell) will normally be decontaminated by rinsing it three times with potable water. If visible contamination is noted (such as dirt, iron staining, or oily residues) then the equipment will be scrubbed with a soap solution prior to the potable water rinses. The module containing the sensors of the water quality meter will only be decontaminated by rinsing it three times with potable water or de-ionized water, as cleaning agents can damage the instrument's sensors. The submersible pump and flow control valve will be decontaminated by the following procedure:

1. Connect the pump to the valve with a short length of tubing
2. Pump approximately 2 gallons of soap solution
3. Pump approximately 10 gallons of potable water
4. Disconnect pump and valve

5. Rinse each (inside and out) with a 10% nitric acid solution

6. Rinse each three times with de-ionized water

For step 3 the second five gallons of potable water can be reused as the first five gallons during the next decontamination procedure. Potable water can be obtained from any drinking water source and should be stored in clean sealed containers. De-ionized water can usually be supplied by the laboratory.

5.1.3 Field Documentation

A field logbook will be kept to record the details of each sampling event. The field logbook will be a bound book with waterproof pages. Information that will be recorded in the field logbook for each event includes:

1. Date(s)
2. Personnel on site
3. Times of arrival and departure
4. Weather conditions
5. Details of activities conducted including time(s) and references to forms completed
6. Details of any variances from this SAP including the reason for the variance
7. Details of interactions with any persons while on-site (owners, neighbors, etc...) including contact information.

All entries in the field logbook will be made in waterproof ink. Each page of the field logbook should be signed and dated by the person or persons making the entries. Any mistakes or changes should be lined out and initialed.

In addition to the field logbook, all appropriate field forms from Appendix A will be completed during each sampling event. For the quarterly methane monitoring events a Methane Monitoring Form should be completed. For the annual groundwater monitoring events a Monitoring Well Purging and Sampling Form for each well, a Water Quality Meter Calibration Form, and a Water Level Measurement Form should be completed. All forms should be filled in completely and signed by the person who completes it. If an entry on the form does not apply, it should be marked N/A and explained in the notes section if necessary.

5.1.4 Field QA/QC Samples

In order to verify data quality, field QA/QC samples will be collected during each groundwater sampling event. The QA/QC samples will include a field duplicate, an equipment rinsate blank, and trip blanks. The field duplicates and equipment rinsate blanks will be collected at a rate of one per twenty regular samples, or at least once per event. Trip blanks will be included with each shipment of samples that includes a regular sample for VOCs.

The field duplicate is collected to analyze the precision of the sampling and analytical methods. The duplicate sample will be collected at a location selected at random, provided sufficient water is present. If sufficient water is not present to collect the duplicate at the selected location, then it will be collected at the next possible location. The duplicate samples will be collected concurrently with the regular samples from the selected location. For example: 4 vials will be collected for VOCs instead of 2. Two will be labeled with the regular sample designation and two will include the suffix -DUP. For dissolved metals samples, the same filter should be used for both the regular sample and the duplicate sample. The field duplicate should be analyzed for all parameters that are monitored during the event.

The equipment rinsate blank is collected to detect possible contamination of the samples during the sampling process. The equipment rinsate blank should be collected after the equipment decontamination procedures are completed following the sampling of the location which typically exhibits the highest parameter values. The rinsate blank is collected by pouring deionized water over the sampling equipment into the sample containers. All sampling equipment that was used during the sampling event should be included in the rinsate blank. This includes pumps, tubing, valves, bailers, twine, and gloves. The dissolved metals rinsate blank should include the filter. For the disposable equipment, new equipment should be used for the rinsate blank. The equipment rinsate blank should be analyzed for all parameters that are monitored during the event.

The trip blanks are used to detect possible contamination of the samples during transport or by the analytical laboratory. The trip blanks are filled with deionized water by the analytical laboratory and included with the sample bottles. The trip blanks should remain with the sample

bottles at all times and should not be opened by the field personnel. The trip blanks are analyzed for VOCs only.

5.1.5 Chain-of-Custody Requirements

To produce evidence quality sampling data, the chain-of-custody of the samples must be maintained and documented from the time of sampling until receipt by the laboratory. The documentation of the chain-of-custody will be made on a Chain-of-Custody Form (COC) similar to the one included in Appendix A. The samples are considered to be in the custody of an individual if they are physically in their possession (i.e. within their field of view) or in secure storage (such as a locked vehicle). All of the samples should be listed on the COCs, and each sample bottle should be accounted for individually. If the samples are shipped by a commercial carrier, each cooler containing samples should be sealed with two signed custody seals, placed such that the cooler cannot be opened without destroying the seal. When properly sealed with signed custody seals, the samples are considered to be in the custody of the signer until the seal is broken. The COCs must be signed by the field personnel prior to relinquishing the samples for transport, signed by any transporters that have custody of the samples, and signed by laboratory personnel upon receipt.

5.2 ANALYTICAL LABORATORY QA/QC PROCEDURES

This section describes the minimum QA/QC procedures that the contracted analytical laboratory will follow to ensure that groundwater analytical results produced from each sampling event are valid and legally defensible.

5.2.1 Sample Receipt Procedures

Upon receipt by the laboratory the samples will be inventoried and compared to the COCs. Any differences between the COCs and the samples received will be resolved by contacting the sampling personnel. The samples will be checked for temperature compliance and any deficiencies will be noted. The preservation of the samples will be checked by testing pH when appropriate, and all deficiencies will be noted and corrected.

5.2.2 Sample Holding Time Requirements

To ensure valid analytical data, each analysis must be conducted within a specified holding time following sampling. The allowable holding times for all parameters are shown in Table 4.

5.2.3 Data Reporting Requirements

The laboratory analytical report should include the values for all parameters, including estimated values below the reporting limit. For each parameter the any necessary qualifiers, the reporting limit, and the data and time of analysis should also be reported. The laboratory analytical report should also include the results of the internal laboratory QA/QC samples that are associated with the field samples. Copies of the sample log in sheets and COCs should also be included.

5.2.4 Laboratory Internal QA/QC Plan

The laboratory contracted to analyze the groundwater samples will have a written internal QA/QC plan that meets USEPA requirements for RCRA analytical laboratories.

5.3 DATA VALIDATION

All analytical data will be validated after receipt from the laboratory to ensure that the results are legally defensible. The validation process will be conducted by a qualified groundwater scientist and will include checks for proper sample preservation, holding time compliance, duplicate precision, control and spiked sample accuracy, and blank contamination.

The temperature at receipt by the laboratory will be checked on the laboratory sample log in sheet. If the temperature is greater than 6°C the results will be flagged with a 'T' qualifier, indicating that the results are considered estimated due to non-compliant temperature. Samples that are hand delivered to the laboratory immediately after sampling will be accepted at greater than 6°C if there is evidence that cooling has begun. The pH of metals, nutrients, and cyanide samples will be checked on the laboratory log in sheet, and the pH of VOCs samples will be checked in the analytical report. Samples with a pH out of compliance by greater than two standard units will be flagged with a 'P' qualifier, indicating that the results are considered estimated due to non-compliant pH. If a non-compliant pH is corrected by the laboratory within

24 hours of sample collection that sample will be considered compliant. If a VOCs sample is analyzed within seven days of sample collection the pH requirement does not apply.

Compliance with the holding time requirements for the samples will be checked by comparing the analysis date and time from the analytical report to the date and time the sample was collected. If the holding time is exceeded the results will be flagged with an 'H' qualifier, indicating that the results are considered estimated due to a holding time exceedance.

The relative percent difference (RPD) for duplicate sample pairs will be calculated to check duplicate precision. The RPD of both field and laboratory duplicates will be considered. If the RPD for a parameter is greater than twenty percent for results greater than five times the reporting limit, or greater than one reporting limit different for results less than five times the reporting limit, all associated results will be flagged with an 'R' qualifier, indicating that the results are considered estimated due to poor duplicate precision.

The results of laboratory control and spike samples will be reviewed in the laboratory QA/QC report. If the results for any parameter fall outside of the laboratory high or low limits the associated sample results will be flagged according to their bias. A 'K' qualifier indicates that the sample results may be biased high and an 'L' qualifier indicates that the sample results may be biased low. 'K' qualifiers will not be reported for non-detect values because the high bias is irrelevant. If the results for a single parameter both exceed the high limit and are less than the low limit in separate control or spiked samples the associated sample results will be flagged with an 'A' qualifier, indicating that the results are considered to be estimated due to poor accuracy of control and spiked samples.

The results of both field and laboratory blanks will be reviewed in the laboratory analytical report, and any detections will be compared to the analytical results for the associated samples. If the sample results for any parameter fall within two times the value detected in an associated blank the results will be flagged with a 'B' qualifier, indicating that the parameter detection may be due to field or laboratory contamination and not representative of actual groundwater conditions.

6.0 HEALTH AND SAFETY PLAN

6.1 SITE HAZARDS

This section describes the hazards that may be generally encountered at the Mr. M Landfill facility, as well as hazards specific to groundwater and methane monitoring activities.

6.1.1 General Hazards

The Mr. M Landfill is closed, thus there are no hazards due to landfill operations. A significant amount of junk material is located throughout the facility, thus care should be taken when driving or walking the site. The structures on the site have not been maintained since closure and should be avoided when possible. Rattlesnakes are native to Montana and have been observed in Fergus County, although none have been reported at this site. General weather related hazards such as heat, cold, mud, dust, snow and ice, and lightning could also be encountered at the site.

6.1.2 Groundwater Monitoring Hazards

Wasps, bees, and spiders can be found in monitoring well casings, thus care should be taken when opening the wells. The twine used with bailers can cause injury to exposed flesh, thus work gloves should be worn when bailing. The pumps used in groundwater sampling are powered by a 12 volt battery and electrical shock could occur if handled improperly. In addition, 12 volt batteries contain sulfuric acid, thus care should be taken that the battery remains upright and is not punctured. The preservatives used in groundwater samples (sulfuric, nitric, and hydrochloric acid, and sodium hydroxide) are strong chemicals, and thus chemical resistant gloves should be worn at all times when handling the preservatives. The groundwater at the Mr. M Landfill is generally not hazardous, although several parameters have exceeded groundwater protection standards. Under no conditions should groundwater from the site be ingested.

6.1.3 Methane Monitoring Hazards

Methane is a flammable gas and thus no open flames or spark producing devices should be used during methane monitoring activities. Care should be taken when opening methane monitoring wells to avoid possible sparks caused by metal-to-metal contact. The methane and oxygen levels

should be monitored continuously when entering facility structures for methane monitoring, and if oxygen levels below 18% or methane levels above 5% are encountered the structure should be exited immediately. All structures should be entered using the buddy system, with one person remaining outside the structure but in visual or audible contact with the person entering the structure at all times. Under no conditions should any confined space be entered.

6.2 LEVEL OF PROTECTION

The general level of protection required at the Mr. M facility is modified OSHA Level D. This level of protection includes:

1. Sturdy work boots
2. Long sleeved shirt and long pants
3. Work gloves

Additional personal protective equipment required during groundwater sampling includes eye splash protection and disposable chemical resistant gloves. Due to the lack of maintenance, a flashlight or headlamp and a hard hat should be used when entering facility structures.

6.3 PERSONNEL DECONTAMINATION PROCEDURES

Personnel decontamination is not a routine procedure during groundwater or methane monitoring activities at the Mr. M facility. Disposable chemical resistant gloves should be changed between each well. If site groundwater comes into contact with skin or eyes it should be rinsed with potable water. If personnel are contaminated by contact with preservatives, remove any contaminated clothing, flush contaminated skin and/or eyes with large amounts of water for at least fifteen minutes, and get medical aid immediately.

6.4 DISPOSAL OF PURGE WATER

All purge water generated at the Mr. M facility will be disposed of on the ground at least fifty feet from the nearest well. The purge water will also be disposed of at least fifty feet from roads, habitable buildings, surface water features, and the property boundaries.

6.5 EMERGENCY INFORMATION

Emergency services can be reached by dialing 911. If non-emergency medical attention is needed, the nearest hospital to the Mr. M facility is the Central Montana Medical Center at 408 Wendell Avenue in Lewistown, Montana. Figure 5 is a map of the location of and directions to the Central Montana Medical Center.

7.0 REFERENCES

- Energy Laboratories, 1997, Analytical Results, October 1997 Sampling
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- Energy Laboratories, 2007, Analytical Results, June 2007 Sampling
- Gillespie, Robert W. P.E., 1993 revised, "Geohydrologic Characterization, Mister M Landfill, Lewistown, Montana"
- Gillespie, Robert W. P.E, 1994, "Addendum to Site Characterization, Mister M Landfill, License No. 302, Lewistown, Montana"
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- Portage Environmental, 1999, "Mr. M Landfill, Water Analysis Report"
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- R.W. Gillespie and Associates, Inc, 1996, "Semi-Annual Groundwater Sampling; Evaluation of Hydraulic Connections; Evaluations of Sampled Water as Leachate, Mister M Disposal Landfill – License No. 302, Lewistown, Montana"
- Tetra Tech, Inc, 2006, "November 2006 Groundwater Monitoring Field Notes, Mister M Landfill, Lewistown, Montana"
- Tetra Tech, Inc, 2008, "December 2007 Groundwater Monitoring Field Notes and Laboratory Report, Mister M Landfill, Lewistown, Montana"

BILLINGS, MT
1120 South 27th (59101)
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Toll Free 800.735.4489
Voice 406.252.6325
Fax 406.252.6069

GILLETTE, WY
1105 West First Street (82716)

Toll Free 866.686.7175
Voice 307.686.7175
Fax 307.682.4625

CASPER, WY
2393 Salt Creek Highway (82601)
PO Box 3258 (82602)

Toll Free 888.235.0515
Voice 307.235.0515
Fax 307.234.1639

HELENA, MT
3161 E Lyndale Ave (59601)
PO Box 5688 (59604)

Toll Free 877.472.0711
Voice 406.442.0711
Fax 406.442.0712

COLLEGE STATION, TX
415 Graham Road (77845)

Toll Free 888.690.2218
Voice 979.690.2217
Fax 979.690.2045

RAPID CITY, SD
2821 Plant Street (57702)

Toll Free 888.672.1225
Voice 605.342.1225
Fax 605.342.1397

Please complete the Chain of Custody with as much detailed information as possible. This information is required so that the appropriate analytical services, reporting and invoicing can be provided for your project.

If services other than standard are required for your analytical project, contact ELI *PRIOR* to sample submittal. Additional charges will be applied for the following services: RUSH TAT, NELAC, A2LA, or Level IV reporting, EDD/EDT, etc.

3. ELI provides quotes for project specific sampling requirements that may include, but are not limited to, non-standard reporting limits, odd matrices, RUSH TAT and specific method requests. It is very important to provide the ELI quote number to assure that you receive the quoted pricing for your project.

4. Basic Aqueous Sampling Instructions: Analytical services include preserved and unpreserved sample bottles, preservatives, and shipping containers at no additional cost. In certain cases, additional charges will be made for special sampling containers (i.e. Tedlar or equivalent bags, 3M or equivalent passive monitors). Preservatives are contained in small vials with color-coded caps and labels that correspond to the table below.

Preservative	Cap Color	Label Color
Hydrochloric Acid	Blue	Blue
Nitric Acid	Red	Fluorescent Red
Non-Preserved (raw)	None	White w/Red Print
Phosphoric Acid	White	White w/Black Print
Sodium Hydroxide	Green	Fluorescent Green w/ Black Print
Sulfuric Acid	Yellow	Fluorescent Yellow
Zinc Acetate	Purple	Fluorescent Green w/ Black Print



Chain of Custody and Analytical Request Record

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

Page ____ of ____

Company Name: ABC Corporation		Project Name, PWS #, Permit #, Etc.: Rockport Reclamation Project	
Report Mail Address: 1234 Main St. Anywhere, MT 59101		Contact Name, Phone, Fax, E-mail: John Smith 605-444-1234 anyone@email.com	Sampler Name if other than Contact: SAME
Invoice Address: P.O. Box 222 City, ST 11111		Invoice Contact & Phone #: Jane Doe 406-555-1212	Purchase Order #: A98765 ELI Quote #: HO1-172
Report Required For: ☐ POTW/WWTP ☐ DW ☐ Other _____		Notify ELI prior to RUSH sample submittal for additional charges and scheduling	
Special Report Formats - ELI must be notified prior to sample submittal for the following: NELAC ☐ A2LA ☐ Level IV ☐ Other _____ EDD/EDT ☐ Format _____		Comments: Spoke to Joe RE: Rush TAT	
SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)		Shipped by: Cooler ID(s) Receipt Temp _____ °C Custody Seal Y N Intact Y N Signature Y N Match Lab ID	
Collection Date	Collection Time	MATRIX	
1	08/01/01 13:10	3-W X X X	
2	08/02/01 09:47	1-S X X X	
3			
4			
5			
6			
7			
8			
9			
10			
Custody Record MUST be Signed		LABORATORY USE ONLY	
Relinquished by (print): John Smith		Received by (print): Mary Cook	
Date/Time: 08/09/04 14:15		Date/Time: 08/09/04 14:15	
Signature: <i>John Smith</i>		Signature: <i>Mary Cook</i>	
Relinquished by (print):		Received by (print):	
Date/Time:		Date/Time:	
Signature:		Signature:	
Sample Disposal: Return to client:		LABORATORY USE ONLY	
Lab Disposal:		# of fractions	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

Fill container with sample and empty contents of preservative vial into container or as instructed. If sample containers are pre-preserved, **DO NOT FLUSH** or **RINSE PRESERVATIVE**. Secure lid and invert slowly to mix.

If you are uncertain of the preservative or preparation required for your sampling project, please contact an ELI representative for instructions.

Proper cooling for specific sample matrices is required. ELI provides resealable bags for crushed ice to be packed around the sample(s). Blue ice or equivalent does not maintain the required 4°C temperature. Samples should be securely packed in the shipping containers provided.

5. Sample Disposal: ELI, when applicable, will dispose of all non-hazardous samples. Routinely, hazardous samples will be returned to client. If requested, ELI will dispose of hazardous samples at client's expense.

Methane Monitoring Form

Site Name: _____ Date: _____

Personnel: _____

Field Conditions: _____

Meter Model: _____

Calibration
Time: _____ Standard: _____ Pre-Reading: _____ Post-Reading: _____

Measurement Point	Time	Methane	Oxygen	CO ₂	Comments
Point A (Soil)	0:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	Baseline (S0)
Point B (Air)	0:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	Baseline (V)
Point C (Soil)	0:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point D (Air)	0:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point E (Soil)	0:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point F (Air)	0:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point G (Soil)	0:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point H (Air)	0:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point I (Soil)	0:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point J (Air)	0:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point K (Soil)	0:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point L (Air)	0:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point M (Soil)	1:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point N (Air)	1:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point O (Soil)	1:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point P (Air)	1:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point Q (Soil)	1:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point R (Air)	1:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point S (Soil)	1:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point T (Air)	1:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point U (Soil)	1:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point V (Air)	1:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point W (Soil)	1:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point X (Air)	1:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point Y (Soil)	2:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point Z (Air)	2:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AA (Soil)	2:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AB (Air)	2:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AC (Soil)	2:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AD (Air)	2:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AE (Soil)	2:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AF (Air)	2:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AG (Soil)	2:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AH (Air)	2:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AI (Soil)	2:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AJ (Air)	2:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AK (Soil)	3:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AL (Air)	3:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AM (Soil)	3:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AN (Air)	3:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AO (Soil)	3:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AP (Air)	3:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AQ (Soil)	3:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AR (Air)	3:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AS (Soil)	3:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AT (Air)	3:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AU (Soil)	3:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AV (Air)	3:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AW (Soil)	4:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AX (Air)	4:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AY (Soil)	4:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point AZ (Air)	4:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BA (Soil)	4:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BB (Air)	4:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BC (Soil)	4:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BD (Air)	4:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BE (Soil)	4:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BF (Air)	4:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BG (Soil)	4:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BH (Air)	4:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BI (Soil)	5:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BJ (Air)	5:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BK (Soil)	5:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BL (Air)	5:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BM (Soil)	5:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BN (Air)	5:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BO (Soil)	5:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BP (Air)	5:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BQ (Soil)	5:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BR (Air)	5:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BS (Soil)	5:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BT (Air)	5:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	6:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	6:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	6:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	6:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	6:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	6:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	6:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	6:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	6:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	6:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	6:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	6:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	7:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	7:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	7:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	7:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	7:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	7:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	7:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	7:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	7:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	7:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	7:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	7:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	8:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	8:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	8:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	8:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	8:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	8:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	8:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	8:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	8:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	8:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	8:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	8:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	9:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	9:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	9:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	9:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	9:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	9:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	9:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	9:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	9:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	9:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	9:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	9:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	10:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	10:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	10:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	10:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	10:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	10:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	10:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	10:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	10:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	10:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	10:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	10:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	11:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	11:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	11:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	11:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	11:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	11:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	11:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	11:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	11:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	11:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	11:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	11:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	12:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	12:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	12:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	12:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	12:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	12:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	12:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	12:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	12:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	12:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	12:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	12:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	13:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	13:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	13:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	13:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	13:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	13:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	13:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	13:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	13:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	13:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	13:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	13:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	14:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	14:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	14:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	14:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	14:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	14:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	14:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	14:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	14:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	14:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	14:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	14:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	15:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	15:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	15:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	15:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	15:20 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	15:25 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	15:30 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	15:35 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	15:40 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	15:45 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	15:50 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	15:55 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	16:00 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	16:05 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BU (Soil)	16:10 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	
Point BV (Air)	16:15 (hr)	0.00 (Vol)	20.90 (Vol)	0.00 (Vol)	

Notes:

Signature:

Table 1: Analytical Parameters from ARM 17.50.708 Table 1.

Inorganics

Chloride	Sulfate	pH	Specific conductance
Cyanide	Nitrate (as N)	Chemical Oxygen Demand (COD)	

Dissolved Metals

Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)
Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)
Iron (Fe)	Lead (Pb)	Mercury (Hg)	Nickel (Ni)
Selenium (Se)	Silver (Ag)	Thallium (Th)	Vanadium (V)
Zinc (Zn)			

Volatile Organic Compounds (VOCs by EPA method 8260)

Acetone	Acrylonitrile
Benzene	Bromochloromethane
Bromodichloromethane	Bromoform
Bromomethane (Methyl bromide)	Carbon disulfide
Carbon tetrachloride	Chlorobenzene
Chlorodibromomethane	Chloroethane
Chloroform	Chloromethane (Methyl chloride)
1,2-Dibromo-3-chloropropane (DCBP)	1,2-Dibromoethane (EDB)
Dibromomethane (Methylene bromide)	1,2-Dichlorobenzene
1,4-Dichlorobenzene	trans-1,4-Dichloro-2-butene
1,1-Dichloroethane	1,2-Dichloroethane
1,1-Dichloroethene	cis-1,2-Dichloroethene
trans-1,2-Dichloroethene	Dichlorodifluoromethane
1,2-Dichloropropane	cis-1,3-Dichloropropene
trans-1,3-Dichloropropene	Ethylbenzene
2-Hexanone (Methyl butyl ketone)	Iodomethane (Methyl iodide)
Methylene chloride	Methyl ethyl ketone (MEK)
4-Methyl-2-pentanone (Metyl isobutyl ketone)	Styrene
1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane
Tetrachloroethene	Toluene
1,1,1-Trichloroethane	1,1,2-Trichloroethane
Trichloroethene	Trichlorofluoromethane
1,2,3-Trichloropropane	Vinyl acetate
Vinyl chloride	Xylenes

Table 2: Purging Stability Criteria

<u>Parameter</u>	<u>Stabilization Criteria</u>
pH	+/- 0.1 standard units
Specific conductance (SC)	+/- 3%
Temperature	+/- 10%
Dissolved oxygen (DO)	+/- 0.3 milligrams per liter
Oxidation-reduction potential (ORP)	+/- 10 millivolts
Turbidity	+/- 10% (or turbidity less than 10 NTUs)

Table 3: Sample Bottles and Preservatives

<u>Parameters</u>	<u>Bottle(s)</u>	<u>Preservation Method</u>
VOCs	2 x 40mL Vials	HCl to pH <2, cool to 4°C
Cyanide	250mL Plastic	NaOH to pH >10, cool to 4°C
Dissolved Metals	250mL Plastic	HNO ₃ to pH <2, cool to 4°C
Nitrate + Nitrite, COD	250mL Plastic	H ₂ SO ₄ to pH <2, cool to 4°C
Chloride, Sulfate, pH, SC	250mL Plastic	Cool to 4°C

Table 4: Holding Times for Table 1 Parameters

<u>Parameters</u>	<u>Holding Time</u>
Sulfate, Chloride, Nitrate + Nitrite, COD	28 days
pH, SC	Analyze Immediately
Cyanide	14 days
Dissolved Metals (Except Mercury)	6 months
Dissolved Mercury	28 days
VOCs	14 days (7 days if unpreserved)



Figure 1: Location Map

Adapted from State of Montana Highway Map.

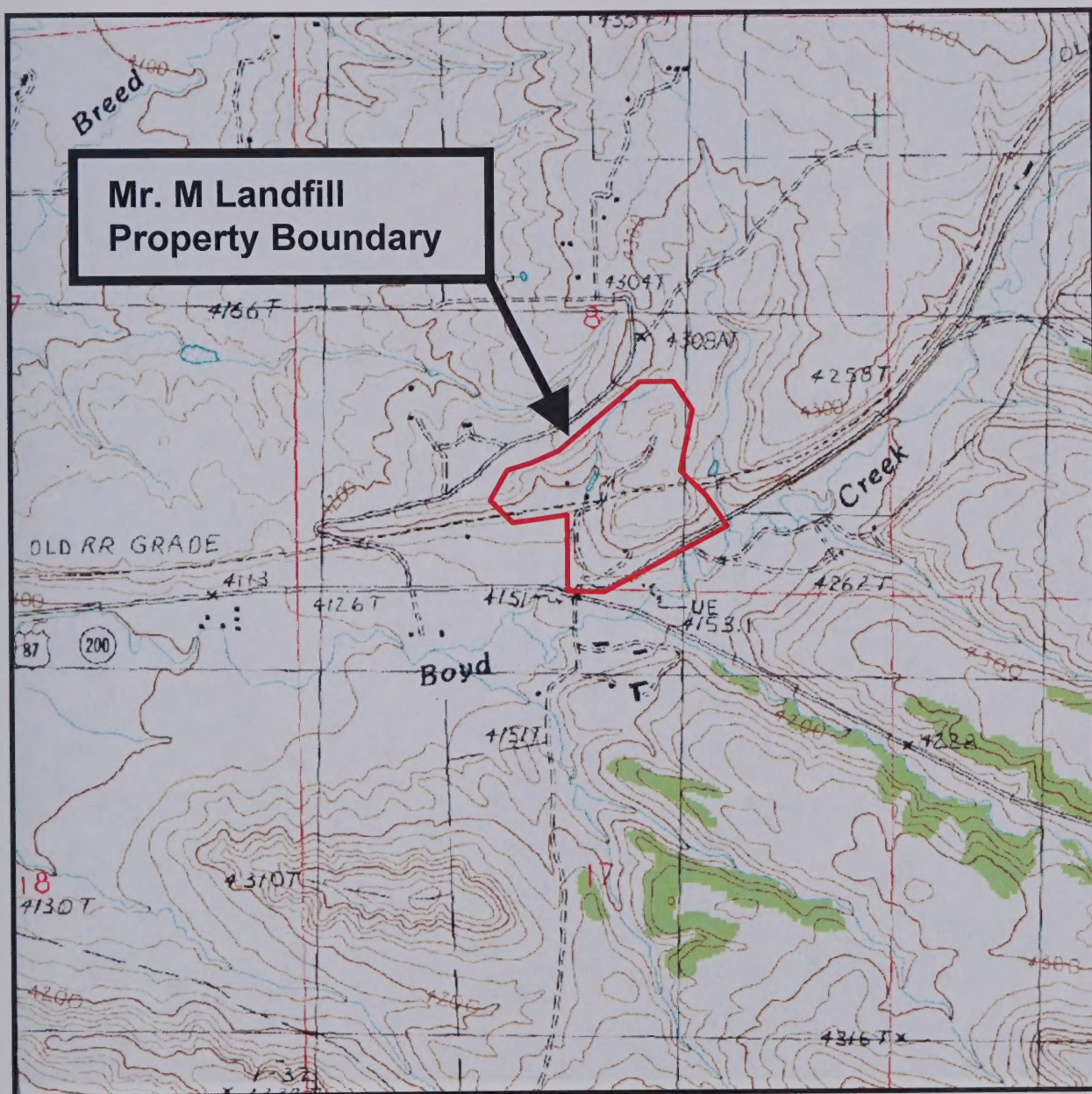


Figure 2: Facility Map

Adapted from USGS Pike Creek 24k Quadrangle.



Figure 3: Locations of Groundwater Monitoring Wells

Base Aerial Photo from 2004.



Figure 4: Locations for Methane Monitoring
Base Aerial Photo from 2004.



Figure 5: Location of Central Montana Medical Center

Adapted from Google Maps.

APPENDIX A: FIELD FORMS

Site Name: _____ Sample Location: _____

Date: _____ Field Conditions: _____

Condition of Well:	Flow	Depth (ft)	Reference	Static Water	Comments

Depth to Water (DTW): _____ Total Depth of Well (TD): _____

Well Diameter: _____ Well Diameter Constant (C): 2" = 0.163 4" = 0.653 6" = 1.469

One Well Volume (gallons) = (TD - DTW) x C: Three Well Volumes:

Purge Equipment: _____ Pump Depth: _____ Start Time: _____

Sample Time: _____ Sampling Method: _____

Total Volume Purged: _____ Final Depth to Water: _____ End Time: _____

Notes: _____

Page of

Water Level Measurement Form

Site Name: _____ Date: _____

Personnel: _____ Equipment: _____

Field Conditions: _____

[illegible]

Notes: _____

Signature:

Page ____ of ____

Water Quality Meter Calibration Form

Site Name: _____ Date: _____

Personnel: _____

Field Conditions: _____

Meter Model: _____

Parameters/Sensors: _____

[illegible]

Notes: _____

[illegible]

Signature:

